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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/642,611

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EXAMINER

VAN ROY, TOD THOMAS

ART UNIT

PAPER NUMBER

2828

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

01/22/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/642,611

Applicant(s)

AOYAGI ET AL.

Examiner

Tod T. Van Roy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 November 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3 and 6-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 7 is/are allowed.
- 6) ☒ Claim(s) 1,3,6,8 and 9 is/are rejected.
- 7) ☒ Claim(s) 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

The examiner acknowledges the amending of claims 1,3, 6, and 8-10.

Response to Arguments

Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection.

The previous rejection of claim 1 over Abe in view of Lo is withdrawn due to the current amendment.

As per the remaining rejection to claim 1 over Abe in view of Lo and Lu:

The applicant has stated that the combination of Abe with Lo is un-obvious due to the fact that Abe teaches an edge emitter and Lo teaches a surface-emitting (SEL) device.

The examiner does agree with the applicant that the Abe and Lo references teach different emission types, but does not agree that the combination is un-obvious.

Lo teaches a SEL that uses both first and second order DFB type gratings (col.1 lines 12-37). Lo teaches the 2nd order gratings to be for out-coupling of the light, and the 1st order gratings to be used for feedback of the light (col.1 lines 12-37) to the interior of the device. Lo then teaches that strong coupling coefficients are beneficial in a number of different ways, including feedback (col.7 line 52 – col.8 line 8). These high values are taught to be possible due to the close proximity of the gain region (col.3 line 50 – col.4 line 10).

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Abe teaches an edge emitting DFB type grating device wherein higher coupling coefficient values are used for feedback from a region in the device (col.12 lines 4-10) in order to output light from the opposite side. Abe further teaches that the values of the coupling coefficients are design elements chosen for particular devices (abs.). Additionally, Abe teaches that the proximity to the gain region determines the strength of the coupling coefficient (col.6 line 61 – col.7 line 27), and the gratings are shown to be formed in close proximity to the gain regions in the disclosed embodiments (all figures).

As outlined above, both Abe and Lo teach their DFB gratings to be used for feedback of light to other regions of the devices. Although each device emits light in a different direction, each device utilizes similar gratings for the same purpose. Abe and Lo have also been shown to teach similar methods of gain to grating location in order to better tailor the coupling coefficient values. The examiner therefor believes that Abe and Lo are in fact related art pieces, and that using Lo to motivate a value of a coupling coefficient of a similar grating used for the same purpose is both reasonable and obvious to one of ordinary skill in the art.

Please see below for an updated rejection to the claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Abe et al. (US 5020072) in view of Lo (US 5617436), and further in view of Lu et al. ("High Power and High Speed Performance of 1.3um Strained MQW Gain Coupled DFB Lasers," IEEE JQE, Vol.1, No.2 1995, pgs.375-381).

With respect to claim 1, Abe teaches a refractive index coupling distributed feedback (DFB) semiconductor laser comprising opposed first and second end surfaces through which light generated within the semiconductor laser may be emitted (fig.4 left and right sides), a central phase shift structure located substantially centrally between the first and second end surfaces (col.9 lines 4-7), and first and second diffraction gratings respectively extending from the central phase shift structure to the first and second end faces (fig.4e), an average coupling coefficient k_2 of a diffraction grating on one end face side (fig.4 right side) is smaller than an average coupling coefficient k_1 of a diffraction grating on the other end face side (fig.4 left side) (col.12 lines 4-10). Abe does not teach the absolute value of the real part of the coupling coefficient to be at

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least 4 times the absolute value of the imaginary part of the coupling coefficient, or the coupling coefficients to be greater than 100cm^{-1} . Lo teaches a DFB semiconductor laser device (fig.1) in which the coupling coefficients are greater than 100cm^{-1} (col.4 lines 11-21). Lu teaches a complex coupled DFB laser in which a real part of a coupling coefficient is at least 4 times an imaginary part of a coupling coefficient (Fig.2, col.3 lines 22-29, where the figure and text describe utilizing real and imaginary components of ratios less than 25%). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the DFB laser of Abe with the large coupling coefficients of Lo in order to increase resonator feedback, utilizing more gain, and allow for the reduction of the laser spot size (col.4 lines 22-25), as well as to combine the DFB laser with complex coupling of Lu in order to have less sensitivity to external reflections (Lu, col.1 lines 14-20) and to provide for enhanced single mode operation (Lu, col.3 lines 24-29).

With respect to claim 8, Abe and Lo teach the DFB device outlined in the rejection to claim 1 and further teach changing the coupling coefficients, k_1 and k_2 , via changing a thickness of a low refractive index layer between that of the active region and the high index grating portion (fig.7, col.11 lines 49-57).

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Abe et al. in view of Lo and further in view of Lu and Huang (US 6574261).

With respect to claim 3, Abe, Lu and Lo teach the DFB device outlined in the rejection to claim 1, but do not teach the device to include a plurality of phase shift

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structures located at substantially symmetrical positions with respect to the central phase shift portion in the diffraction gratings. Huang teaches a DFB semiconductor laser utilizing multiple phase shift structures (fig.9), located at substantially symmetrical positions with respect to the central phase shift portion in the diffraction gratings. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the DFB laser of Abe, Lu and Lo with the multiple phase shift structures of Huang in order to uniformly distribute carriers and reduce spatial hole burning (Huang, col.12 lines 47-50).

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Abe et al. in view of Lo and further in view of Lu and Takahashi et al. (US 5727015).

With respect to claim 6, Abe, Lu and Lo teach the DFB device outlined in the rejection to claim 1, but do not teach the device to have a higher ratio of higher index material to lower index material in the k1 region than in the k2 region. Takahashi teaches DFB semiconductor laser in which the duty of the gratings is examined based on coupling coefficient values (fig.3a, in which it can be understood that a high coupling region, k1, could have a larger duty than a low coupling region, k2, this duty being defined as the length of the higher index region to the lower index region, col.1 lines 63-67, fig.1- comparing higher index #106 to lower index #108 as analyzed in fig.3a). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the DFB laser of Abe, Lu and Lo with the high to low duty values of Huang in order to appropriately couple the E-field to a desired grating region.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Abe et al. in view of Lo and further in view of Lu and Weber (US 5379318).

With respect to claim 9, Abe, Lu and Lo teach the DFB device outlined in the rejection to claim 1, but do not teach the device to satisfy the relationship that the effective index through grating2 times the period of grating2 be almost equal to the effective index of grating1 times the period of grating1. Weber teaches a semiconductor laser in which an effective index through a grating2 times the period of a grating2 be almost equal to the effective index of a grating1 times the period of a grating1 (fig.1 #G1,G3; the effective index of G3 would be greater than that of G1 due to the larger amount of high index grating material, but the period of G1 would be greater than that of G3 in order to correctly fit the relationship shown in fig.2, this leads to the approximate balancing of $N_{effG1} * PeriodG1$ almost equal to $N_{effG3} * PeriodG3$). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the DFB laser of Abe, Sato and Lo with the grating structure of Weber in order to allow for a larger degree of wavelength selectivity.

Allowable Subject Matter

Claim 10 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Claim 10 is allowable for the same reasons outlined in the previous advisory action (paper no.02012006) as it is largely a duplicate of former claim 2.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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PRIMARY EXAMINER 